

Evaluation of Dietary Patterns and the Related Factors in Pregnant Women Who Referred to Health Centers in Qom, Iran

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Background & Aims of the Study: Pregnancy is one of the most important stages in the life of women. It is associated with increased nutritional requirements since pregnant women are very vulnerable to malnutrition. Therefore, this study was conducted to determine the food groups intake pattern and its effective factors in pregnant women in Qom, Iran.

Materials and Methods: This cross-sectional descriptive-analytic study was conducted on 360 pregnant women who referred to health centers. Two questionnaires were used to collect demographic and dietary recall information. The collected data were analyzed in SPSS software (version 20) using descriptive statistics, independent t-test, ANOVA, and chi-square.

Results: Based on the results of this study, the mean age, weight, and height of the subjects were 27.72 years, 72.59 kg, and 162 cm, respectively. Moreover, the mean daily intake of bread and cereals, milk and dairy products, fruits, vegetables, meat and egg, nuts and legumes, and miscellaneous groups were 8.26, 1.91, 4.60, 1.90, 2.43, 1.82, and 0.81 respectively. The mean of total daily calorie intake was 1424.81. Furthermore, a significant correlation was found between economic status and daily calorie intake ($P < 0/05$).

Conclusion: The daily consumption of milk and dairy products, vegetables, meat and eggs, and nuts and legumes were less than the recommended standard. This indicates the need for education of pregnant women and the facilitation of the relevant factors for the reception of these food groups.

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Background

Pregnancy is one of the most important periods in the life of a mother, which is accompanied by an increase in their nutritional needs (1). Since nutrition plays an important role in maternal and child health (2), a healthy diet guarantees a successful pregnancy and

delivery (3). Therefore, the provision of the needed micronutrients is necessary to prevent the loss of body reserves and maintenance of good health (4). According to previous studies, fetal growth depends on adequate maternal access to food (5). A balanced diet has a positive effect on fetal growth and supports the mother during pregnancy, childbirth, breastfeeding (6), and other aspects of her life

(7). On the other hand, an unhealthy diet during pregnancy can lead to several complications, including intrauterine growth restriction, miscarriage, preterm delivery, and fetal abnormalities, especially low birth weight (8, 9).

The nutritional needs of women undergo major changes during pregnancy, which is due to the needs of the fetus and the other changes that affect the absorption and metabolism of food (10). Some studies have found that inadequate maternal energy intake increases the risk of low birth weight, and maternal obesity with high blood pressure, preeclampsia, and gestational diabetes (11). Recent research has shown that most pregnant women do not follow a healthy diet and need to improve their dietary pattern (12). The recommended daily calorie intake for pregnant women is 300 kcal (13) and carbohydrates are the primary source of energy for them (14). One of the side effects of lack of energy is an increase in the production of ketones in the blood of a pregnant woman, which puts the fetus at the risk of metabolic disorders (15).

The risk of intrauterine growth restriction and fetal death is higher in women with inadequate energy intake or weight gain (16). The American Medical Association and the Academy of Sciences have recommended 11.5-16, 12.5-18, and 7-11.5 kg weight gain during pregnancy for women with normal, below normal, and above normal weight (17). Moreover, protein intake during pregnancy is essential for the provision of amino acids, and thereby the increase of maternal blood volume and tissue growth, fetal growth and development, and energy metabolism (14). Another important nutrient for pregnant women is calcium. If the mother does not receive enough calcium, the bones will lose their calcium, which will eventually lead to maternal osteoporosis. Studies have revealed that the consumption of calcium supplements during pregnancy reduces the risk of eclampsia (18).

Iron deficiency can lead to anemia with decreased hemoglobin and red blood cells, premature birth, and maternal mortality (18). A healthy diet for pregnant women must include four or more units of fruits and vegetables, four or more units of fortified cereals or bread, four or more units of milk or dairy products, and three or more units of meat, legumes, and nuts in order to prevent complications caused by malnutrition. On the other hand, excessive amounts of nutrition intake also cause complications, such as high blood pressure, gestational diabetes, delayed birth, and increased prevalence of cesarean section (19).

Currently, nutritionists use dietary assessment to assess the overall effect of diet on health outcomes (20-23). Food patterns are based on culture, race, and various environmental factors (availability, buying power, and advertisement) (24). Calorie malnutrition has long-lasting effects on the health of mothers and children which indicates the need for a healthy diet during pregnancy. Assessment of the quantitative and qualitative nutrition status of pregnant women and the factors affecting it can be useful in the recognition of their needs and improvement of their diet so that it will be possible to maintain the health of the mothers and neonates and establish a healthy future for children. Therefore, the present study aimed to determine the food group consumption patterns and the factors influencing it in pregnant women who referred to health centers in Qom, Iran.

Materials & Methods

This descriptive-analytical study was performed on 360 pregnant women who referred to health centers in Qom. The statistical population of this study was pregnant women living in Qom in 2016. For sampling, the city was divided into four clusters based on the city divisions, and a health center in each cluster was selected and considered a category.

In each category, according to the number of patients' active records and sample size, the required number of cases were randomly selected. The sample size of the study was calculated based on a study performed by Abedini et al. (25) and considering a type I error of 0.05, and a precision of 0.3. Finally, the sample size of the present study was calculated at 360 subjects.

$$n = \frac{z^2 p(1-p)}{d^2}$$

The inclusion criteria consisted of 1) visit to health centers during pregnancy, 2) single pregnancy (as opposed to twin pregnancy), 3) health record in health centers of Qom, and 4) regular visits to a health center. On the other hand, the exclusion criteria were 1) unwillingness to participate in the study, 2) lack of cooperation, 3) lack of consent, and 4) non-completion questionnaire. After the purpose of the study was explained and the project manager was introduced to the subjects and the heads of the health care centers, the eligible mothers were asked to participate in the study if they were willing. Moreover, all the pregnant mothers were assured that the obtained information were recorded anonymously and kept confidential. The data collection was performed after presenting a letter of introduction from the Research Deputy of Qom University of Medical Sciences to the health centers.

The data were collected through questionnaires and interviews with pregnant women. The first part was a demographic characteristics form which included personal, social, and pregnancy history information. The second part collected information about the frequency and amount of consumed food, which was completed according to the 24-hour dietary recall questionnaire that recorded all the food consumed by the participant over the past

24 hours. This questionnaire was used in a study titled "Relationship of Vitamin E and C Consumption and Preeclampsia/Eclampsia in Pregnant Women" by Atarodi et al. and the scientific validity of the questionnaire was confirmed through content validity. Moreover, its scientific reliability was 100% confirmed through simultaneous observation and correlation coefficient (26). The completion of each questionnaire took 25-20 min.

Sufficiency of the food groups was determined using the index (number of consumed units divided by the recommended number of units) \times 100 (27). Values below 80%, 80-100%, and above 100% were considered less than (low), equal to (appropriate), and more than the recommended daily intake (high), respectively. The recommended amounts (based on the dietary guidelines for pregnancy provided by the World Health Organization) were 7-11 units of bread and cereals, 3-4 units of fruit, 4-5 units of vegetables, 3 units of meat, eggs, nuts, and legumes, 3-4 units of dairy products, and a maximum of one unit of sweets and junk food (28). The amount of the consumed food was calculated in units (shares) and the specified food groups were placed in the food pyramid.

The body mass index (BMI) was calculated by using the weight of the mother at the beginning of the pregnancy. The BMI was calculated by dividing the weight (in kilograms) to the square of the height (in meters). Values below 20, 20-25, 25-29, and above 29 were considered underweight, normal, overweight, and obese, respectively. The height of the subjects was measured with a tape measure while standing without shoes with an accuracy of 0.1 cm. It should be noted that the people in charge of the questionnaires and BMI measures were female. After the approval of the proposal of the research, the questionnaires were distributed to collect the data. Finally, the data were analyzed in SPSS software (version 20) using the independent t-tests, ANOVA, and chi-

square test to determine the relationship between the studied variables.

Results

According to Table 1, the average age of mothers was 27.27. The average weight was 72.59. The average height was 161.5. The average body mass index was 27.48 (15.59-61.43). The mean gestational age was 23.5 weeks (2-42 weeks). The average number of pregnancies was 2 pregnancies (1-7).

The analysis of the results by using descriptive statistics showed that 6.4% (23 people), 18.1% (65 people), 42.8% (154 people), 32.8% (118 people) of the participants had elementary school, junior high school, high school, and academic education, respectively. Moreover, in terms of employment, 14.2% (51 people) were employed, while 85.8% (309 people) were housewives. Regarding the education level of the spouse, 2.5% (9 people) were illiterate, while 6.4% (23 people), 16.4% (59 people), 33.6% (121 people), and 41.1% (148 people) had elementary school, junior high

school, high school, and academic education, respectively. In terms of the occupation of the spouse, 22.6% (81 people), 53.8% (193 people), 5.8% (21 people), 2.5% (9 people), 0.3% (1 person), 41.1% (5 people), and 13.4% (48 people) were clerk, self-employed, clerics, farmers, retired, unemployed, and occupied with other jobs.

According to the Table 2 and the descriptive statistics, the mean value of daily received units in the groups of bread and cereals, milk and dairy products, fruits, vegetables, meat and eggs, and nuts and legumes group were 8.26, 1.91, 4.60, 1.90, 2.43, 1.82, and 0.81. This table shows that in the group of milk and dairy products and vegetables, the received amount by the mothers is less than the recommended standard. Moreover, the mean daily calorie intake of pregnant mothers was 1424, which is about 1000 calories less than the recommended standard.

Table 3 shows that the miscellaneous group is consumed more than the rest of the groups before breakfast. Moreover, at the time of breakfast, bread and cereals group is consumed more than the other ones. Furthermore, at the

Table 1) Demographic characteristics of the subjects

Variable	Mean	Range	SD
Age	27.72	17-43	5.25
Weight	72.59	40.167	15.45
Height	162	145-178	5.48
BMI	27.48	61.43-15.59	5.48
Gravidity	2	1-7	1.039
Number of family members	2.86	2-6	0.85
Gestational week	23.5	2-42	10.69

Table 2) Food groups consumption pattern of the subjects

Food groups	Number of recommended standard units	Number of daily received units	Range of the recommended standard units	Range of daily received units
Bread and cereals	7-11	8.26	80-100	75-118
Milk and dairy products	3-4	1.91	80-100	47-63
Fruits	3-4	4.60	80-100	115-153
Vegetables	4-5	1.90	80-100	38-47
Meat and eggs	3	2.43	80-100	81
Nuts and legumes	3	1.82	80-100	60
Miscellaneous	1	0.81	80-100	81
Calorie	2403	1424.81	-	-

Table 3) Received food units and calories per meal

Time	Bread and cereals	Dairy product	Fruits	Vegetables	Meat and egg	Legume and nuts	Other groups	Total calories
Before breakfast	0.138	0.106	0.315	0.008	0.04	0.082	1.019	59.03
Breakfast	1.80	0.80	0.22	0.15	0.17	0.279	0.71	301.53
Snack	0.147	0.111	1.48	0.083	0.011	0.219	0.011	125.95
Lunch	2.99	0.22	0.022	0.710	1.172	0.483	0.003	349
Evening snack	0.289	0.146	1.51	0.168	0.22	0.283	0.025	153.67
Dinner	2.789	0.235	0.96	0.767	0.99	2.789	0.025	331.29
Before sleep	0.094	0.296	0.915	0.022	0.018	0.093	0.018	104.9

time of morning and evening snacks, fruits are consumed the most while at lunchtime the consumption of bread, cereals, meat, and eggs is more frequent than the other groups. For the evening snack, there is a tendency to consume fruits more than the other groups. Besides, at dinner, the bread and cereals, as well as the nuts and legumes, are preferred over the other groups. Before sleep, there is a tendency to eat fruits, milk, and dairy products. It should be noted that the highest calorie intake occurs at lunch, dinner, and breakfast and among the snacks, the evening has more calories than the morning snack.

Based on the results of the Pearson correlation coefficient test, the weight of the subjects had a significant relationship with the consumption of other groups before breakfast ($P<0.05$). Moreover, there was a significant association between the height of the participants and the amount of consumed meat and egg ($P<0.05$). There was also a statistically negative relationship between the gravidity of the subjects and the consumption of legumes and nuts ($P<0.05$). At the time of the breakfast, the gestational age had a significant relationship with the consumption of the miscellaneous group and the total calorie intake ($P<0.05$). At the time of the evening snack, the bread and cereals had a statistically negative relationship with age ($P<0.05$).

The findings revealed that based on the results of the Pearson correlation coefficient test, the calorie intake had no significant relationship with age, weight, height, gestational age, gravidity, and the number of

family members ($P>0.05$). Furthermore, the ANOVA and independent t-test showed that the calorie intake was not associated with the education level and occupation of the subjects and their spouses ($P>0.05$). However, there was a significant relationship between calorie intake and economic status ($P<0.05$).

According to the findings, the results of the Pearson correlation coefficient test revealed a significant relationship between meat consumption and weight of the subjects. Moreover, the gestational age had a significant association with the consumption of meat, dairy products, and snacks. Furthermore, the results showed that BMI had no significant relationship with the total calorie intake, while it did have a significant relationship with the consumption of meat and eggs. Moreover, there was no significant relationship between BMI and other food groups. Most of the pregnant women who participated in this study were overweight and obese (about 65%), while about one-third of them had normal weight. The number of underweight subjects was less than the other ones.

Discussion

Based on the results, the majority of pregnant women were overweight and obese, while they received about 1,000 fewer calories than the recommended standard in terms of energy intake. This indicates their unhealthy diets which include the consumption of low-value foods. Similar to the present research, in a

study conducted by Delvarian et al., in Shahroud, the energy intake of women was lower than the standard (28). Moreover, in a study performed by Poboelik et al., despite the fact that the energy intake and consumption of other nutrients in pregnant women were lower than the standard level, most mothers were overweight (29).

A study carried out by Bakhtiari et al. in Babol found that more than 90% of pregnant women consumed all the food groups (8), which is inconsistent with the findings of the present study. This difference could be due to varieties in environmental and cultural factors. On the other hand, the inappropriate and excessive use of food or an unhealthy diet can cause overweight and obesity in pregnant women. Overweight and obesity should be checked and controlled before pregnancy, and the best solution is to reach a normal weight before trying to conceive. Pre-pregnancy care and checkup, planned pregnancy, prevention of unwanted pregnancies, and delay in pregnancy until a more appropriate weight is achieved, especially in obese women, are good solutions for this problem. It is also important to follow a healthy diet and control weight and weight gain for each part of the body based on the recommended standards. Failure to do so will cause a pregnant woman who had a normal weight before pregnancy to become overweight and obese during pregnancy.

The results also showed that the consumption of dairy products and vegetables was much less than the recommended daily intake. However, few studies have been conducted on milk consumption in pregnant women. A study carried out in the United States found that 66% of pregnant women consume milk. Besides, another study on the milk consumption of female adolescents in different countries showed that in Bangladesh, the majority of them do not consume milk. While in France and Canada, milk and dairy products were among the most consumed items (30-33).

The consumption of milk and dairy products in the study population of the present research was less than the other countries (34).

Another study performed by Montazerifar et al. found that the insufficient consumption of milk and dairy products was more prevalent among the people under the age of 18 (35). In the studies conducted by Abedini et al. and Karimi et al., the results regarding the consumption of dairy products were consistent with those of the present study. Given the importance of milk and dairy products during pregnancy and breastfeeding both for the mother and the fetus, it is recommended for future studies to investigate the reasons for the inadequate consumption of milk and dairy products in order to develop appropriate plans and implement necessary measures.

In the present study, the consumption of bread and cereals was within the recommended range and in a better status than the other food groups. However, according to the results of a study conducted by Montazerifar et al., the consumption of bread and cereals was less than the standard level in women over 30 years old (especially in the last trimester of pregnancy) and those with less than or normal weight (35). Similarly, in the studies carried out by Karimi et al. (37) and Farahaninia et al. (1), pregnant women consumed insufficient amounts of bread and cereals. Another study performed in Maku by Esmailzadeh et al. found that urban women consume significantly more bread, cereals, dairy products, and fruits in comparison with urban women (34). This difference could be due to several reasons, including different food patterns in cities and villages, access/lack of access to healthier foods, and desire/lack of desire to eat fatty or fast food.

The results of the present study indicate that the consumption of the fruit was desirable, while that of the vegetables was not. The results of the study conducted by Karimi (37) et al. showed that 43% of pregnant women consumed the proper amount of fruits and vegetables. The

findings of the above-mentioned study are consistent with those of the studies performed by Esmailzadeh et al. (34), Nasrabadi et al. (38), and Takimoto et al. (39) (in Japan) and inconsistent with those of the studies carried out by Van et al. (40) and Farahani Nia et al. (1).

The results of the present study showed that the consumption of meat and legumes was below the recommended standard. These results were consistent with those of a study performed by Karimi et al. and inconsistent with those of another study conducted by Takimoto in Japan (39). One of the reasons could be the widespread consumption of seafood in Japanese culture.

The results of the present study also showed that the consumption of the miscellaneous group and the preference for its use in snacks before breakfast was more frequent than the other groups. There was also a significant relationship between the consumption of other groups and the gestational age. Montazerifar et al. in their study found that the consumption of other groups, such as fat and sugar was less common in underweight pregnant women (35). Furthermore, the results of another study conducted by Abedini et al. indicated that overweight and obese pregnant women consumed more sweets and sugars, compared to the other groups (25). It seems that there is a need to inform and educate mothers about the standard level of consumption of the miscellaneous group and its harms.

Moreover, the findings of the present research revealed that the most calorie intake happened at lunch and dinner in that order. On the other hand, despite the recommendations that say breakfast is an important meal and should provide a good calorie intake, compared to other meals, fewer calories were consumed at breakfast. Furthermore, it is emphasized that the dinner should contain the least number of calories in comparison to other meals. A diet that provides more calories at dinner than breakfast can affect weight gain and cause

obesity in pregnant women.

In the present study, the calorie intake had no significant relationship with age, weight, height, BMI, gestational age, number of pregnancies, number of family members, as well as the education level and occupation of the subjects and their spouses. However, in the study performed by Delvarianzadeh et al., the nutritional status of pregnant women had a significant relationship with the level of education, occupation, the date of the last visit to the doctor or health centers, and possession of a house (28). Mohammadi Nasrabadi et al., in their study found that during pregnancy, the weight of the mother increases with parity and the gestational week, while it decreases with the increase of age and pre-pregnancy BMI (38). Another study performed by Mahmoudi et al. (37) on the relationship of demographic variables with the diet showed that the employed pregnant women had a better status regarding the consumption of meat, legumes, fruits, and vegetables compared to housewives. Furthermore, pregnant women with academic education had a better status regarding the consumption of all the food groups, compared to women with high school education or less. This difference was statistically significant.

In the present study, the dietary pattern had a significant relationship with the income level, while it had no significant relationship with the other demographic variables. Increase in the level of income and, in turn, the increase of food purchasing power seems to affect and improve the nutritional status of mothers. Regarding the non-significance of other demographic variables in the present study, additional and more specialized studies are needed to further investigate the issue. In addition, since the study was conducted on women referring to Qom health centers, employed women may have less time to refer to the health center. As a result, more planning and research should be performed to identify the reasons.

On the other hand, training programs and large-scale national decisions should be made to improve the nutritional status of pregnant women. Among the barriers and limitations of the study were the generalizability of the findings, the self-report data collection tools, and the lack of investigation of the cause-and-effect relationships. The strengths of this study were the use of a 24-hour dietary recall questionnaire and the separation of meals, the number of consumed calories, and food groups.

Conclusion

According to the results, the daily intake of the mothers regarding the groups of milk and dairy products, vegetables, meat and eggs, and nuts and legumes was less than the recommended daily intake. Moreover, their mean daily calorie intake was approximately 1000 calories less than the recommended daily standard; however, overweight and obesity were prevalent among them. The findings also revealed that the nutrition pattern had a significant relationship with the level of income, while it did not have such a relationship with the other demographic variables. Therefore, further planning and research are needed to identify the reasons why overweight and obesity are prevalent among pregnant women, despite their low calorie intake. Besides, large-scale national education and decision-making are required to improve the nutritional status of pregnant mothers.

Footnotes

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Conflict of Interest

The authors declare that they have no conflict of interest regarding the publication of this article.

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